October 2000

SPACE TRACKS

A NAVAL SPACE COMMAND BULLETIN ON NAVAL SPACE ISSUES AND INITIATIVES

Space and Information: The Warfighter's Edge

Communications Requirements, Information Analysis Model Demonstration Accomplished By NAVSPACECOM Space Cell During JWID

By Lt. Paula Labbe and
IT1 Wanda Schmidt

Naval Space Command recently participated in the Joint Warrior Interoperability Demonstration (JWID). The demonstration ran for the three-week period of July 10-28.

JWID is an annual warfighting demonstration sponsored by the Joint Staff to showcase evolving command and control, communications, computers, intelligence and reconnaissance (C4ISR) technology tools. JWID 00 provided a near real-time, multi-theater conflict scenario to identify and solve warfighting deficiencies through multiple hands-on demonstrations.

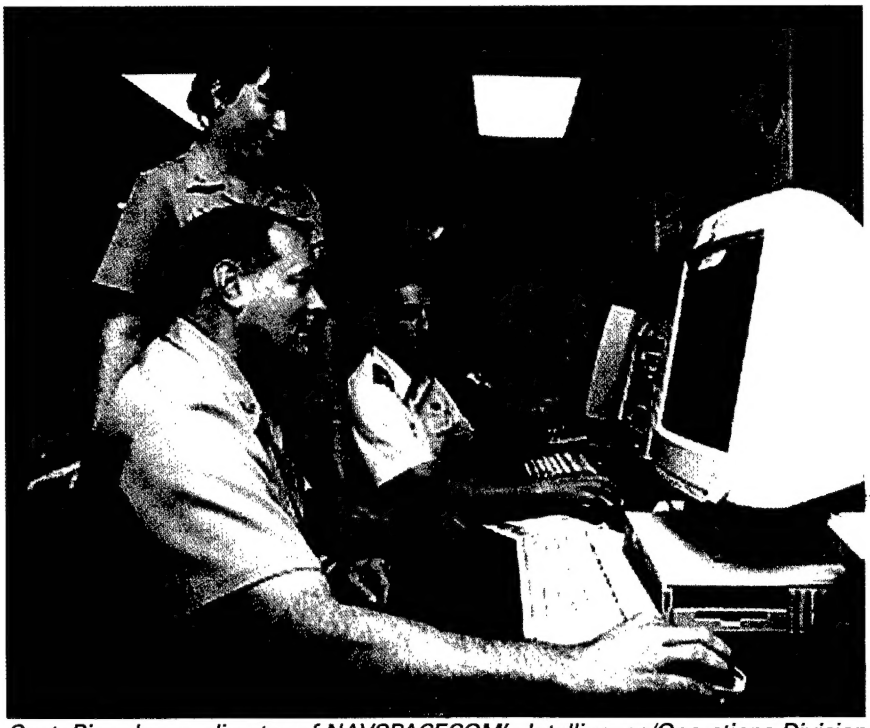
A different branch of the military service hosts this technology demonstration every two years. The lead service for JWID 00-01 was the U.S. Air Force, and the sponsoring commander in chief (CINC) was U.S. Space Command. As the sponsoring CINC, USCINCSPACE determined the focus of JWID 00-01.

The importance of space in JWID 00-01 — and what the space warfighter brings to military operations — was emphasized by the commander in chief for U.S. Space Command, Air Force Gen. Ralph E. Eberhart: "Today space-based assets collect and transmit a significant portion of the information critical to military operations. It is clear this reliance on space will continue to grow. There's no going back."

JWID technology demonstrations are held on two-year cycles. During the first year or theme year, commercial and governmental agencies are requested to address specific interoperability and warfighting deficiencies, as identified by the warfighter, by providing reliable, cost-effective solutions to deficiencies using new or evolving technologies.

These demonstrations are assessed by the warfighter and "Gold Nuggets" — the most promising technologies — are identified during this theme year. During the second or exploitation year, the "Gold Nuggets" are further refined with the intent of making them ready for acquisition for the warfighter.

*(Please see **JWID** on page 3)*



Capt. Bing Jones, director of NAVSPACECOM's Intelligence/Operations Division (N2/3), checks features of the Space and Information Analysis Model being demonstrated in the JWID Space Cell. Observers are Lt. Paula Labbe of Naval Reserve NAVSPACECOM 0266 and Maj. John F. Manney Jr. from N2/3.

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NAVSPACECOM DIRECTORY

Naval Space Command provides direct space support to Fleet and Fleet Marine Force operational units around the world, whether for routine deployments, exercises, or actions in response to a crisis situation. We take very seriously our duty of ensuring that our Sailors and Marines understand what products are available from space, how to access them, and how to exploit those products in the waging of war and peace.

○ Operational Status/Exercise Support Summaries

Naval Space Command maintains a home page on the Global Command and Control System (GCCS) accessible to operational U.S. military forces worldwide at http://navspac1.navspace.navy.smil.mil or http://206.36.197.10.

○ Naval Space Operations Center (540) 653-6500

Call Toll-Free at 1-888-404-6557. Source of space-related operational intelligence. Space reports and analyses are activated on request and are tailored to a deploying unit's operations and geographic area of movement. Tactical assessments of space system capabilities and vulnerabilities to potentially hostile space sensors are also available.

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○ Remote Earth Sensing Information Center (540) 653-6520

Naval space Command employs imagery from remote Earth sensing satellites to support intelligence, planning, and operations. Our Remote Earth Sensing Information Center (RESIC) — formerly known as the MSI Cell — processes Landsat, SPOT, and Controlled Image Base (CIB) data in support of Fleet and Fleet Marine Force units. Hardcopy and softcopy products, specifically tailored to users' needs, are produced by RESIC and distributed to support forces participating in real-world crisis, operations, and exercises. RESIC products can be produced to support any of the following applications:

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- Bathymetry
- Order of Battle Disposition
- Change Detection
- Broad Area Coverage
- Intelligence Prep of the Battlefield
- Mission Rehearsal
- Amphibious Support
- Supplement MC&G Products
- Trafficability

Product requests can be submitted via GENADMIN message to: COMNAVSPACECOM DAHLGREN VA//N313//, via facsimile to DSN 249-6167 or (540) 653-6167, via email to MSI@manta.nosc.mil, or via Naval Space Command's SIPRNET web page.

○ Internet On-Line Access

Naval Space Command maintains a home page on the World Wide Web at URL http://www.navspace.navy.mil. Comments or requests for information may be forwarded to the Public Affairs Office via email to gwagner@nsc.navy.mil.

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NAVSPACECOM, Navy Reserve Support From Worldwide Locations

JWID

(Continued from page 1)

JWID 00 featured 29 demonstrations organized under five capstone statements. These capstone statements were defined at the outset of the first or theme year of JWID to enhance the joint warfighter's ability to plan, coordinate, and execute a mission in a Joint Task Force environment. The five capstone statements are:

- Demonstrate support to the warfighter that integrates space forces and space-derived information with air, land, and sea forces and their information.
- Demonstrate global and scaleable dominant battlespace awareness in a Combined Task Force (CTF) setting.
- Demonstrate the ability to responsively unify, integrate, and expedite ISR support to the warfighter through a single interface.
- Demonstrate enhanced information superiority technologies in a combined/coalition environment.
- Demonstrate the ability to interoperate diverse VTC and collaborative planning systems. Demonstrate seamless interoperability in all phases and among all Service and Combined/ Coalition partner C4ISR systems, and in particular focus on those involved in Theater Air and Missile Defense (TBMD).

Naval Space Command's involvement in this demonstration was two tiered: the command provided direct support to the Combined Forces Land Component Commander (CFLCC) and participated as the naval component of U.S. Space Command. NAVSPACECOM members operated a Space Cell in support of the CFLCC from the Theater Warfare Center located on board the Naval Surface Warfare Center Dahlgren Division, Dahlgren, Va.

The Space Cell fulfilled CFLCC communications requirements ranging from access and configuration of available satellite communication (SATCOM) systems, space weather, and performance issues such as survivability in a jamming environment.

A featured demonstration at the Space Cell was the Space and Information Analysis Model (SIAM). SIAM analyzes the flow of information on the battlefield to determine target priorities and information degradation from effects-based targeting. SIAM displays communications paths, identifies choke points, prioritizes targets, and analyzes strategies/courses of action.

NAVSPOC Assesses Tools

Naval Space Operations Center (NAVSPOC) personnel were tasked to assess the interoperability and warfighting effectiveness of the Space Battle Management Core Systems (SBMCS). SBMCS is a support tool USSPACECOM uses to maintain situational awareness and battlespace management. SBMCS brings together data from various providers such as the 55th Space Weather Squadron (SWSX), 2nd Space Operations Squadron (SOPS), Space Defense Operations Center (SPADOC), and components (Army, Navy).

SBMCS products include Space Tasking Orders (STOs), Global Positioning System (GPS) navigation accuracy predictions, satellite vulnerability, system status, and space environmental assessments.

JWID support provided by Naval Space Command included Naval Reserve personnel deployments to various JWID sites around the world. Naval Space Command was represented at the Joint Battle Center, Va.; Cheyenne Mountain Operations Center (CMOC), Colorado Springs, Colo.; Space and Naval Warfare Sytems Command headquarters, San Diego, Calif.; Camp H. M. Smith, Hawaii; SHAPE; England; Australia; and New Zealand. Other Naval Reserve support for JWID came from Naval Reserve units that support the Naval Surface Warfare Center Dahlgren Division, as well as Naval Space Reserve Program (NSRP) units.

Authors Lt. Paula Labbe and Information Technology Specialist 1st Class Wanda Schmidt are both assigned to Naval Reserve NAVSPACECOM 0266.

The Theater Warfare Center on board the Naval Surface Warfare Center at Dahlgren, Va., was the principal site for the Combined Forces Land Component Commander during JWID 00.

Navy Initiative Improves Tracking of Space Objects

By Lt.Cmdr. Brian K. Baldauf

The Navy is using a space sensor capable of measuring upper atmospheric drag effects on satellites to help analysts predict their orbits with greater precision.

Naval Space Command and the Naval Research Laboratory (NRL) are partners in an effort to use near-real time neutral density specifications to improve the Special Perturbation (SP) orbit determination system recently developed by NRL and installed at the Naval Space Command.

Molecules that have no electrical charge, along with oxygen ions, are the components in the upper atmosphere that most directly impact the amount of atmospheric drag on satellites and other objects orbiting the Earth. Climatological models provide only a rough estimate of the density of neutrons in the upper atmosphere and the amount of drag they induce on satellites.

The Navy's investigation is focused on developing a method to precisely measure those neutral elements and characterize their effects in near real time. The combined efforts of the Naval Space Command/NRL team will successfully transition new technology from Navy research to improve the performance, effectiveness and reliability of our space surveillance operations.

The SP orbit determination capability for low-altitude objects currently uses the Jacchia atmospheric model to estimate atmospheric drag. It can also use the Mass Spectrometer Incoherent Scatter (MSIS) model, which is more recent and is based on a much larger database. Both models are empirical and climatological in nature and carry a typical atmospheric density specification error of 15-25 percent. As a result, these climatological models can induce as much as 1 to 20 kilometers per day in position error.

NASA and other customers that use Naval Space Command's surveillance data have levied more stringent space tracking requirements that call for reducing this uncertainty to 30-100 meters per day. This level of accuracy is necessary to provide better collision avoidance and to protect critical assets such as the International Space Station and the Space Shuttle.

For these reasons, one of the most important applications of near-Earth space environmental forecasting is the routine estimation of upper atmospheric drag on objects in low-Earth orbit (LEO), that is, at altitudes less than 2,500 kilometers. Drag on LEO objects is the largest source of error in orbit determination, primarily because of the inaccuracy of upper atmospheric density estimates.

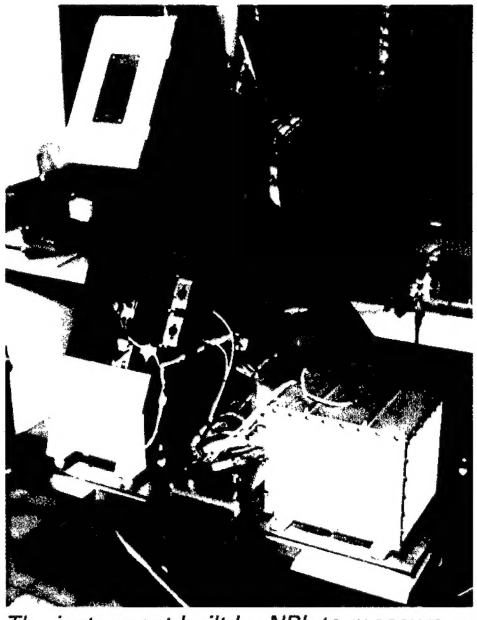
Characterizing Atmospheric Drag Improves Accuracy

Accurate estimations of atmospheric density become even more difficult following space weather-induced thermospheric disturbances or an increase in geomagnetic activity, such as solar flares. These events can introduce increased numbers of charged particles into the upper atmosphere, which in turn, increases drag experienced by satellites, causing them to lose altitude and gain orbital velocity.

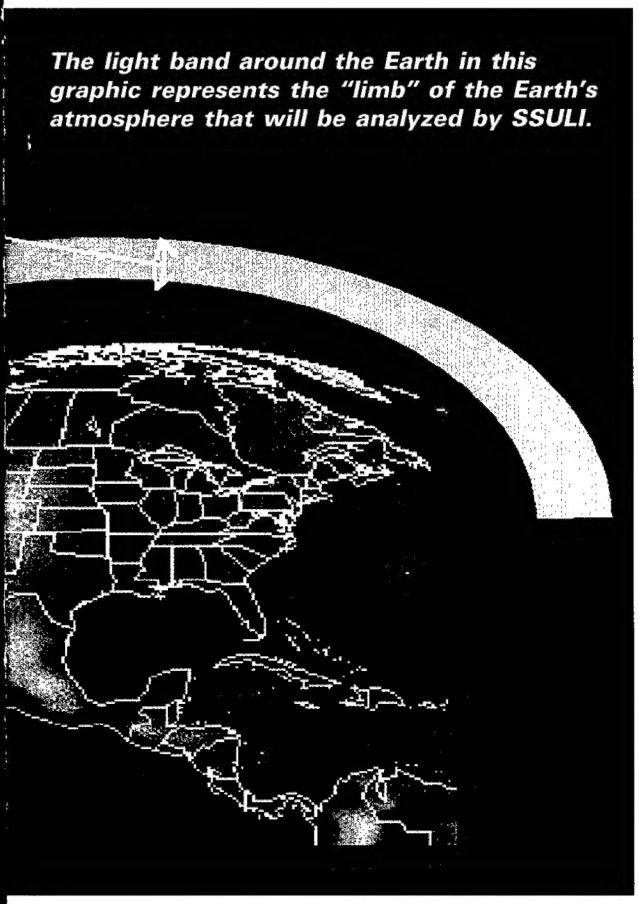
Ultimately, the disruption to activities devoted to tracking and cataloging space objects becomes costly, both in terms of dollars and national security.

NRL has developed instrumentation and processing software to monitor the composition of the Earth's atmosphere using ultraviolet remote sensing. As part of this research, NRL has built five ultraviolet remote sensing instruments for the Air Force's Defense Meteorological Satellite Program (DMSP). These instruments, known as Special Sensor Ultraviolet Limb Imagers (SSULIs), will be part of the DMSP Block 5D3 satellites scheduled for launch starting in late 2000.

In addition, an extensive operational data processing system known as Ground Data Analysis Software (GDAS) has been developed and will be hosted by the Air Force Weather Agency (AFWA). The purpose of the



The instrument built by NRL to measure the near-Earth atmospheric composition using the ultraviolet spectrum is pictured in the bottom photo.



The light band around the Earth in this graphic represents the "limb" of the Earth's atmosphere that will be analyzed by SSULI.

SSULI program is to provide detailed measurements of the composition of the upper atmosphere and ionosphere over an entire 11-year solar cycle.

Every 90 seconds, the SSULI sensors will observe limb airglow intensities from 100 to 117 degrees from the satellite zenith at extreme-ultraviolet and far-ultraviolet wavelengths from 800 to 1700 Angstroms. Operational analysis programs will analyze these intensities to determine the neutral density (no electric charge) and the atomic oxygen ion (positive electrical charge) density in the upper atmosphere at altitudes of 75 to 750 kilometers.

The future capability to be provided by the SSULI instruments is currently being tested at NRL using the Low-Resolution Airglow and Aurora Spectrograph (LORAAS).

The LORAAS sensor is an exact copy of the DMSP SSULI sensor and was launched on Feb. 23, 1999, aboard the Air Force Space Test Program (STP) Advanced Research Global Observing Satellite (ARGOS). The ARGOS satellite is in a sun-synchronous orbit at an altitude of 833 kilometers. Data from this sensor is being used to validate the SSULI sensor and environmental products as well as to demonstrate potential benefits to DoD systems.

Since June of this year, as part of the demonstration process, the LORAAS data has been used in near real time by NRL to begin to assess and improve atmospheric drag estimates and orbit determination capabilities. Results from several studies indicate that combining near real time data in the orbital plane with a state-of-the-art empirical atmospheric density model will produce a global specification of neutral density which is superior to that obtained from empirical models alone.

The demonstration of this capability will be accomplished by downlinking approximately 10 minutes of near real time LORAAS data to the Naval Research Laboratory's ground station at Blossom Point, Md., anywhere from two to six times daily as the satellite passes directly overhead. As the LORASS downlink is received, advanced data processing software installed at Blossom Point will remove the raw UV limb sensor data and distribute the data via File Transfer Protocol (FTP) to the Air Force's 55th Space Weather Squadron for processing in GDAS.

Enhanced Capability Benefits Space Operations

The GDAS output will provide the neutral atmospheric parameters and will be distributed via Secure Internet Protocol (SIPRNET) to Naval Space Command for ingestion in the high-resolution Special Perturbation (SP) model for precise orbit determination. Precise element sets will then be generated by Naval Space Command for designated space objects and delivered to customers as required.

The validation of accurate near-real-time drag estimates will be accomplished by using well-known orbits from selected test space objects. State vectors for these objects will be propagated using optimal MSIS parameters that are derived from the SSULI/LORAAS data. To do this, the optimized MSIS parameters are retrieved for the appropriate time periods and then fed to the SP software currently operational at Naval Space Command.

Improvements in the resulting state vectors, constructed with the SSULI/LORAAS data, will be evaluated by comparing them to orbits constructed without the benefit of the sensor data.

Simulations of neutral densities derived from LORAAS data indicate that correcting the MSIS model based on coincident UV observations of the upper atmosphere may reduce in-track space object position errors due to atmospheric drag to meet the more stringent customer requirements anticipated in the near future.

In addition to providing more precise tracking of designated space objects, this effort will enhance several other key operational functions at Naval Space Command. Improvements will include more accurate naval space surveillance operations and maintenance of the space object catalog, which presently includes over 9,000 objects — active and inactive satellites as well as space debris.

As a result, other mission areas such as Calculation of Miss Distance Between Objects (COMBO), re-entry calculations, Search and Determine (SAD) on uncataloged objects, and Resident Space Object (RSO) orbit predictions will also be improved.

Author Lt.Cmdr. Brian Baldauf is the staff meteorologist for Naval Space Command. This article is based on a paper he authored along with Stefan Thonnard, J. Michael Picone and Andrew Nicholas from the Naval Research Laboratory.

Space-Based Infrared System to Provide Critical Battlespace Awareness

By Lt. Bruce Dickey

Naval warfighters will require full spectrum dominance in the future to defeat threats and optimally conduct operations. The Space-Based Infrared System (SBIRS) sponsored by the United States Air Force will play a crucial role in providing battlespace awareness by using non-imaging infrared and visible sensors on satellite platforms in conjunction with a ground-based element to track missiles during the boost, post-boost, and midcourse phases of flight.

Scale model of the SBIRS High GEO satellite.

SBIRS will enhance the commander's situational awareness by providing timely support to battle damage assessment (BDA), technical intelligence (TI) collection, theater missile warning/defense (TMW/D), weather, space surveillance, and battlespace characterization (BSC).

"System Of Systems" Concept

SBIRS is the Air Force program for the future of all DOD non-imaging IR satellite systems, replacing the existing Defense Support Program (DSP) satellites. The development of SBIRS is being accomplished in a number of increments. Increment 1 is the consolidation of existing ground segments and the start-up of the SBIRS Mission Control Station (MCS). The MCS will serve as the CONUS-based primary processing and analysis facility for all SBIRS missions.

Complimentary to the MCS and fulfilling theater CINC requirements for in-theater processing of SBIRS will be the existing Joint Tactical Ground Station (JTAGS). JTAGS units, operated by both the Army and the Navy, will continue to provide the theater commander a dedicated asset to support operations. Increment 1 will not include changes to the space segment and will rely on the existing and planned DSP satellites. The initial operating capability (IOC) for Increment 1 is projected to be fall 2001.

High and Low SIBRS

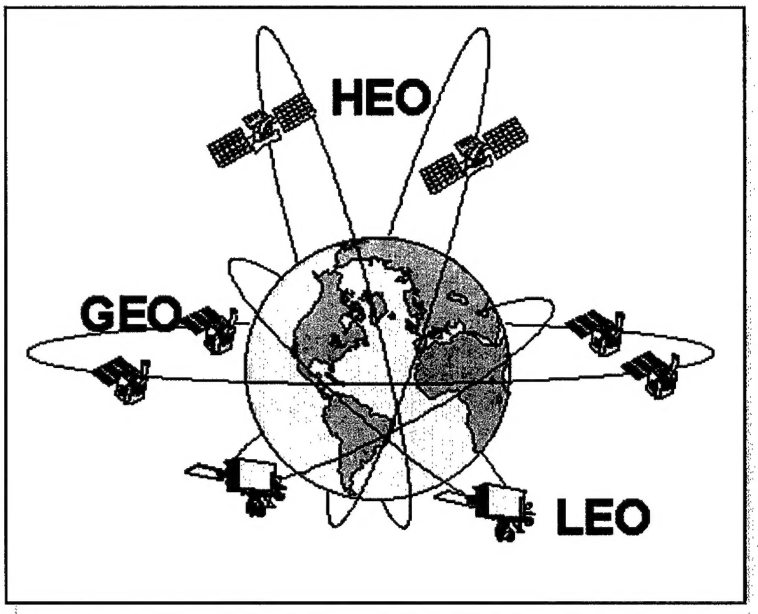
Increment 2 will consist of the introduction of new geostationary (GEO) and highly elliptical orbit (HEO) satellites. The GEO satellites are referred to as SBIRS High and the HEO satellites are referred to as SBIRS HEO.

SBIRS High will replace the existing DSP satellites and will provide a significant increase in sensor capability. While DSP was designed with strategic, "Cold War" type threats as the driving requirement for early detection, SBIRS High is designed to accomplish detection, classification, and tracking of both strategic and theater ballistic missiles.

SBIRS High data will be processed by both the MCS and the follow-on system to JTAGS, the Multi-Mission Mobile Processor (M3P). Improved TBM launch detection and impact point prediction, missile identification, and state vector at burnout will provide added benefit to all pillars of theater missile defense: passive defense (PD), active defense (AD), attack operations (AO), and C4ISR.

Improved missile impact point and time of impact predictions will allow more flexibility and greater response time for passive warning measures to

take effect. With the greatly improved impact point prediction, fewer forces will need to be alerted of an incoming TBM. Likewise, a greater accuracy in launch point and launch time information will enable attack operations forces to improve their performance against TBM launchers and their supporting infrastructure.



Using multiple orbit configurations, the SBIRS architecture is a "system of systems" that, as a whole, will satisfy all mission requirements.

With the improved state vector at TBM booster burnout and the associated error covariance matrix, naval active defense forces will be able to utilize this information to cue in-theater weapons systems. This cueing information from SBIRS will allow such systems as the Navy Area TBMD System to increase their defended area and better protect forces ashore.

Characterizing the Battlespace

SBIRS information will be disseminated to the warfighter through existing and planned communications links. In order to provide a "no single point of failure" to the theater CINC, both the MCS and the in-theater processor (M3P) will separately process SBIRS data and disseminate it to the forces.

The primary path for the MCS will be the TRAP Data Dissemination System (TDDS). For the M3P, the communications pathway will be both the Tactical Information Broadcast System (TIBS) and the Joint Tactical Information Distribution System (JTIDS). The M3P, in addition, will have numerous communications capabilities such as SIPRNET and SINCGARS to support joint forces.

While the TMD role of SBIRS is a primary mission, the role of SBIRS in characterizing the battlespace must not be overlooked. SBIRS will provide an invaluable resource for reporting all IR events of significance. The system will provide the warfighter information to assist with BDA, aircraft surveillance, cruise missile defense, and artillery fires detection. SBIRS' contribution to the goals of information and knowledge superiority can be significant.

The first launch of SBIRS High will occur in the fall of 2004, with the full constellation of 4 satellites achieving operational capability in 2008.

Aid to Space Surveillance

Increment 3 will consist of a number of low Earth orbit (LEO) satellites that will provide above-the-horizon detection and tracking of objects.

Originally conceived to support national missile defense (NMD), SBIRS Low will also support the theater warfighter. SBIRS Low will be required to track TBMs in the post-boost phase and will achieve remarkable accuracy for TBM position and velocity. This information will be provided in a timely manner to theater forces for them to effectively enhance the performance of their active defense systems.

For the Navy, the Navy Theater Wide (NTW) weapon system will utilize information from SBIRS Low to increase their battlespace, depth of fire, and probability of kill.

SBIRS Low will also have the ability to assist the warfighter in new ways. The SBIRS Low system will be able to report on weather conditions over an area in a timely and continual manner in order to provide the most up-to-date information to strike planners. The first launch of SBIRS Low is scheduled to occur in 2006.

Articulating Fleet Requirements

With the operational capability SBIRS will provide, the warfighter will be able to more confidently plan operations and be provided information to assess an operation as it unfolds. As a taskable system, SBIRS will answer to warfighter requirements for non-imaging IR information in a timely and assured manner.

Naval Space Command has been an advocate of naval requirements for space systems throughout the SBIRS development process. In conjunction with the OPNAV staff, Naval Space Command is working to articulate the requirements set forth by Fleet Commanders and weapon systems developers.

In addition, Naval Space Command is developing potential Concept Of Operations (CONOPS) in order for the warfighter to best integrate SBIRS information into their operations.

Author Lt.Cmdr. Bruce Dickey recently served as an action officer in the Space Systems Branch in Naval Space Command's Plans Division.

SPACE BILLETS

OFFICERS The following is a partial listing of officer billets with space missions, whose incumbents are scheduled to transfer between now and April 2001. for specific billet information and actual availability dates, contact your detailer.

Billets With Subspecialty Code XX76 (Space Systems - Operations)

ACTIVITY	TITLE	BDES	BGRD	BSUB1	BSUB2	AVAIL
CNSC DET VB	AF EXCHANGE OFF	1000	LT	0076P		AVAIL
NAVSPACECOM	OPS/INTEL/ANALYST	1000	LT	0076S		AVAIL
USSPACECOM	CMD DIR	1050	CAPT	0076Q		0010
NAVSPACECOM	SPACE REQ ANALYST	1100	LCDR	0076P	0089S	0012
NSA/CSS FT MEADE	ELEXQ RESEARCH ENG	1610	LT	0076P		0010
USSPACECOM	SPACE CONT	1100	LT	0076S		0010
NSGCD FT MEADE	NSG SPEC OPS	1610	LT	0076P		0010
USSPCOM COS GDIP	SENIOR SMEO	1630	LT	0076S		0010
NSGCD DET POT DC	CLASSIC WIZ	1610	LCDR	0076P		0011
CINCUSNAVEUR	COMM/PLNS AND OPS	1100	LCDR	0076S	0089S	0012
USSPACECOM	ORBITAL ANALYST	1000	LT	0076S		0012
USN ELMT DODPROJ	EXERCISE ANALST	1050	LCDR	0076B	0046B	0012
USSPACECOM	CH THEATER EVE	1100	LT	0076P		0012
USSPACECOM	AIR DEFENSE	1100	LT	0076S		0101
USSPACECOM	MILSATCOM	1050	CDR	0076P		0101
NAVSPACECOM	FLAG AIDE	1000	LT	0076S		0102
NAVSPACECOM	OPS/INTEL/ANALYST	1000	LT	0076S		0102
NSGCD POT FT MD	OIC SHR ACTIVITY	1610	CDR	0076S		0102
USSPACECOM	SPACE OPS	1050	CDR	0076S		0103
USSPACECOM	CMBT ANALSTY	1050	LT	0076S		0104
USSPC WASH LIAS	CH MSL DEF	1050	CDR	0076S		0105
NAVSPACECOM	OPS/INTEL/ANALYST	1050	LCDR	0076S		0104

Billets With Subspecialty Code XX77 (Space Systems - Engineering)

ACTIVITY	TITLE	BDES	BGRD	BSUB1	BSUB2	AVAIL
SPAWAR	SPACE PJ TECH	1510	CDR	0077P		0008
USNELMT DODPROJ	DIR OPS OSO	1050	CAPT	0077P		0008
USSPACECOM	ELEC ENG	1050	LT	0077S		0009
SPAWARSYSCOM	SPACE ACQ	1510	CDR	0077P		0009
PEOSPACOMMSENS	DEP DPJ MGR	1510	CAPT	0077P		0009
SPAWARSYSCOM	DPJ SUP/JMCOMS	1440	LCDR	0077S	0055P	0009
SPAWAR	SPACE ACQ	1610	LCDR	0077P		0010
SPAWAR DET DENVER	NAV PLANT REP	1100	LT	0077B		0010
NAVAL ACADEMY	INST ENG	1440	LCDR	0077P		0010
PEO-SCS OFFICE	MGR RPJ FE/MIL	1440	CDR	0077P		0011
SPAWAR	MAG PJ MGR	1510	CAPT	0077P		0012
SPAWARSYSCOM	MAJ PJ MGR SEL	1440	CAPT	0077B		0101
NSSA	CHIEF, CAPABILITIES	1510	CAPT	0077P		0102

ENLISTED BILLETS

AT NAVAL SPACE COMMAND
DAHLGREN, VIRGINIA

Following is the allowance for enlisted personnel at Naval Space Command, Naval Surface Warfare Center Dahlgren Division, Dahlgren, Va. Dahlgren is located approximately 50 minutes from Washington, D.C., and three hours from Norfolk, Va. The base is also home to the Aegis Training & Readiness Center and the Navy's only active gun testing range. You will also find a small Navy Exchange, commissary, gymnasium, auto and wood hobby shops, year-round pool, library, chapel, theater, and numerous outdoor recreation facilities. If you would like more information about one of the Navy's "best kept secret" duty stations, or would like a welcome aboard package, feel free to contact Lt.Cmdr. Ray Lewis at DSN 249-5001 or commercial (540) 653-5001 (email address: lewis@nsc.navy.mil) or the Command Master Chief, MTCM(SS) Alan P. Steiner. Master Chief Steiner can be reached at DSN 249-6115 or commercial (540) 653-6115 (email address: asteiner@nsc.navy.mil). If you are interested in receiving orders to Naval Space Command, contact your detailer.

CTA:		E7:1	E6:2	E5:2	E4:1
CTR:			E6:1	E5:2	
EA:		E7:1			
ET:		E7:2		E5:4	E4:2
EW:	E8:1			E5:2	E4:2
FC:			E6:1		
IS:		E7:1	E6:2	E5:4	E4:3
NC:		E7:1			
OS:		E7:3	E6:5	E5:3	E4:13
RM:		E7:2	E6:3	E5:9	E4:1
SK:				E5:1	
YN:			E6:1	E5:2*	

*One YN2 billet is TAR.

Exercise Tests Operational Impact of Computer Network Attacks

By Lt. Robert C. Cooper

As evidenced in recent denial of service attacks on major Internet websites and widespread email virus attacks, the issue of computer security is becoming increasingly important and a growing problem on a worldwide scale. The exponential growth of the Internet has significantly outpaced the development of adequate security measures needed to protect critical information networks.

U.S. Space Command was assigned the new mission of computer network defense (CND) for the Department of Defense (DoD) in October 1999, and tasked to provide a single point of contact within DoD to direct strategic CND.

U.S. Space Command's first opportunity to exercise this mission and evaluate the underlying command and control architecture occurred during Exercise Apollo CND. The exercise's main objective was to train staffs and test plans, procedures and concepts for the CND mission. The scenario took place April 14-20 with participation from U.S. Space Command and its components.

Naval Space Command participated in exercise Apollo CND as the naval component to U.S. Space Command. NAVSPACECOM reported to U.S. Space Command for all space-related issues. Additionally, CND issues discovered by Naval Space Command were reported to the Navy Computer Information Response Team (NAVCIRT) in the Fleet Information Warfare Center (FIWC), which in turn reported to the Navy Component Task Force-Computer Network Defense (NCTF-CND), the naval component of the Joint Task Force for CND.

U.S. Space Command used the input it received from JTF-CND to heighten INFOCON (Information Condition) threat levels as appropriate throughout the exercise.

Naval Space Command reacted to many CND events including an attack on a public Internet web server that compromised its operation, a simulated computer worm attack on the command's unclassified email server, and increased network probes (network scans and connection attempts).

As the threat of computer network attack (CNA) increased, U.S. Space Command changed INFOCON levels to deal with the increased threat. With each increase in INFOCON level, Naval Space Command implemented more steps to increase computer security. Performing these steps allowed the command to assess not only its ability to protect its systems, but also the impact of the various INFOCON levels on the command's operational activities.

In addition to CND events, U.S. Space Command added space events to the Master Scenario Event List for the exercise. Exercise events requiring Naval Space Command action included several satellite anomalies.

Naval Space Command maintained a 24-hour Naval Space Operations Center (NAVSPOC) Watch Officer (NWO) at all times during the Apollo CND with a crisis action team on recall to be used when necessary. In addition to this watch, two liaison officers were provided to U.S. Space Command to augment their crisis action team.

Following the exercise, NAVSPACECOM's Intelligence/Operations Division and Information Systems Division submitted "lessons learned" from Apollo CND to U.S. Space Command to be used for planning and coordination of next year's computer network defense exercise.

Author Lt. Robert Cooper is a Naval Space Operations Center (NAVSPOC) Watch Officer in the Intelligence/ Operations Division at Naval Space Command headquarters in Dahlgren.

Naval Research Laboratory Instrument Slated for Launch in 2005

Navy Develops Critical Components for Gamma Ray Mission

The Naval Research Laboratory (NRL) is a member of an international consortium recently selected by NASA to develop the primary instrument for the Gamma Ray Large Area Space Telescope (GLAST).

GLAST, the next major space mission to study high-energy astrophysics, is planned for launch in 2005 for a minimum five-year mission.

GLAST is the successor to the Energetic Gamma-Ray Experiment Telescope (EGRET) flown on NASA's Compton Gamma Ray Observatory (CGRO), which recently ended its mission after many years of successful observations. GLAST will be 50 times more sensitive than EGRET and will detect gamma rays at high energies ranging from 20 million to 300 billion electron volts. The study of gamma rays is expected to provide essential insight into physical processes driving celestial objects.

Gamma rays are the most penetrating type of electromagnetic radiation, and allow a direct view of the high-energy processes acting in the innermost regions of cosmic accelerators such as pulsars, black holes, and supernova remnants. GLAST will be sensitive enough to detect several dozen gamma-ray pulsars, which, scientists say, will reveal new details about the life cycle of massive stars in our Galaxy.

NRL's Gamma and Cosmic Ray Astrophysics Branch is responsible for the design, development and test of the massive calorimeter for GLAST. The principal function of the calorimeter is to measure the energy of incoming gamma rays.

The main GLAST instrument is a wide field-of-view imaging telescope, which consists of a tracker that determines the trajectory of the gamma ray being measured, and the NRL-developed cesium-iodide calorimeter.

Matter and Antimatter

Gamma rays interacting in the tracker are converted into electron-positron pairs — pairs of matter and antimatter — that multiply and cascade into a "shower" of charged particles and photons (also known as an electromagnetic shower). The calorimeter collects and measures the energy from these showers to determine how much energy is in each gamma ray.

The passage of these particles through the cesium-iodide crystals produce flashes of scintillation light that are photoelectrically converted to voltages, or electrical signals. These signals are then digitized, recorded and relayed to Earth by the spacecraft's onboard computer and telemetry system.

The accuracy of the energy measurement is largely determined by the calorimeter's ability to collect all the energy from the shower of particles created by the interaction of the gamma ray with the GLAST instrument, notes NRL investigator, Dr. Neil Johnson. The penetrating nature of these particles requires a massive calorimeter to stop or capture them.

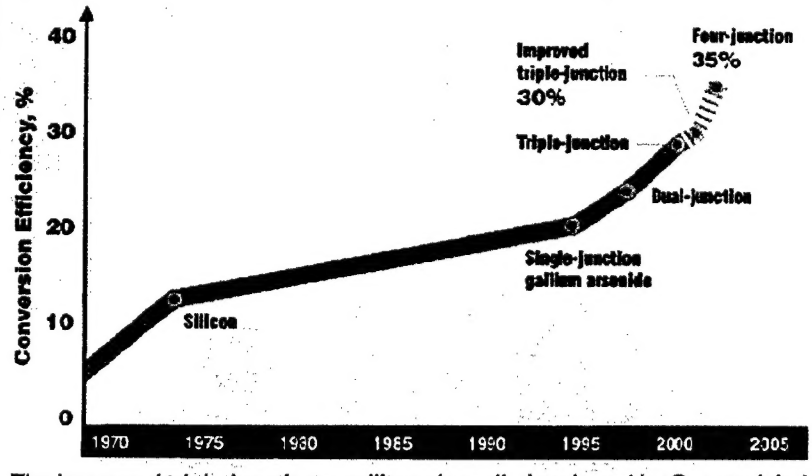
In GLAST, the calorimeter is about 60 percent of the weight of the experiment. GLAST uses 1350 kilograms of thallium-doped cesium iodide scintillation crystals to form the calorimeter. These crystals, known for their durability and high resistance to thermal and mechanical shock, look much like rock salt, but are polished like lead glass and emit light when gamma rays or charged particles interact with them. GLAST uses over 1500 CsI crystals.

NRL's X-ray Astronomy Branch is responsible for building the computers used to discriminate gamma rays from background cosmic rays in the events seen by GLAST. "The problem is challenging because background events are several thousand times more numerous than the gamma rays," says investigator Dr. Kent Wood. "The gamma rays must be distinguished from the cosmic rays by differences in patterns produced by energy deposited in the tracker and calorimeter."

Crucial first stages of this pattern recognition are done in the onboard computers. The high data volumes and event rates call for a high throughput computing system, able to operate reliably in the space radiation environment. NRL has built a prototype processor, using the PowerPC 603e chip. — *Naval Research Laboratory*

Technology On the Move ...

Space Solar Cell Efficiencies on the Rise



The improved triple-junction satellite solar cell, developed by Spectrolab, Inc., will result in a solar array power output in the range of 20 to 30 kilowatts.

Sideboys render arrival honors for Rear Adm. J. J. Quinn during a change of command ceremony at Naval Space Command headquarters in Dahlgren.

Rear Admiral J. J. Quinn Assumes Command

Rear Admiral J. J. Quinn relieved Rear Admiral Thomas E. Zelibor as commander for Naval Space Command during an informal turnover ceremony on June 8.

Rear Admiral Zelibor, who held command since October 1998, moved on to his new assignment as commander of Carrier Group 3.

Rear Admiral Quinn reports from his previous tour as commanding officer of the nuclear-powered aircraft carrier USS *Abraham Lincoln*. He becomes Naval Space Command's 14th commander.

A native of Imperial, Pa., Rear Admiral Quinn graduated from the United States Naval Academy in June 1974 with a bachelor's degree in mathematics. He completed flight school and was designated a Naval Flight Officer in September 1975.

In subsequent tours, Rear Admiral Quinn flew in the F-4J Phantom with Fighter Squadron VF-11 aboard the aircraft carrier USS *Forrestal*, and later in the F-14 Tomcat with Fighter Squadron VF-2 aboard the aircraft carrier USS *Kitty Hawk*.

In April 1987, Rear Admiral Quinn was selected for duty in the White House where he served as the Naval Aide to Presidents Ronald Reagan and George Bush prior to returning to VF-2 as executive officer in 1989. He assumed command of the squadron in 1991, deployed aboard the aircraft carrier USS *Ranger*, and flew 51 combat missions in support of Operation Desert Storm.

On his return from the Persian Gulf, Rear Admiral Quinn attended the Navy's Nuclear Power School. In subsequent tours, he served as executive officer of the nuclear-powered aircraft carrier USS *Nimitz*, and in command of the amphibious transport USS *Juneau*. He assumed command of USS *Abraham Lincoln* in February 1998.

Among his other assignments, Rear Admiral Quinn served with the Navy Fighter Weapons School (Top Gun) as an instructor in fleet air defense fighter tactics, and on the staff of Commander Carrier Group 2/Battle Force Sixth Fleet homeported in Naples, Italy.

Over the length of his career he has accumulated over 2,800 flight hours and 550 carrier landings. His military decorations include the Defense Superior Service Medal, Legion of Merit, Bronze Star, two Meritorious Service Medals, four Air Medals (2 Individual with Combat "V"/2 Strike-Flight), and four Navy Commendation Medals (2 with Combat "V").

A Proud Tradition

(From left) OS2 Troy Massey stands ready to render arrival honors; Rear Adm. Thomas Zelibor addresses military and civilian members prior to reading his detaching orders; and Sailors "haul down" Rear Adm. Zelibor's flag as he relinquishes command.

Naval Reserve Detachment Provides Crucial Support to Manned Space Program

By Cmdr. Charles Gay

When space enthusiasts flock to Kennedy Space Center to observe the spectacular event of a shuttle launch, they may not realize just how much behind-the-scenes support is required. The Department of Defense plays a significant role in ensuring the safety of the astronauts in the event of a contingency abort during the launch, on-orbit, or landing phase of each mission.

The National Aeronautics and Space Act of 1958 directed DOD to make its resources available to assist NASA for the country's initial manned space flight effort. As a result, in 1959 the Secretary of Defense chartered the DOD Mercury Support Group (DDMS).

Since those early days, DDMS, now officially known as the Department of Defense Manned Space Flight Support Office, has continued to be the focal point for all DOD contingency support to Projects Mercury, Gemini, Apollo, Apollo/Soyuz, Space Shuttle, and the coming International Space Station.

NAVSPACECOM Naval Reserve Unit 0266 has provided a two-man detachment since 1993, which supports DDMS during all phases of Space Shuttle missions, working alongside U.S. Space Command active-duty and reserve counterparts.

Capt. Bill Readdy (former astronaut and NAVSPACECOM Naval Reserve commanding officer), along with Randy Segert (a NAVSPACECOM Naval Reserve "plank owner" who works for NASA at Kennedy Space Center), saw a need for reserve support at DDMS and were responsible for establishing the detachment.

Currently, the detachment is provided for by the NAVSPACECOM 0266 unit, commanded by Cmdr. Mark Hyman. The general mission of Naval Reserve Unit 0266 is to augment NAVSPACECOM in wartime and provide contributory support to the Fleet. Types of support to NAVSPACECOM include augmenting watchstanders in the Naval Space Operations Center, training and deploying with Fleet assets to operate the Joint Tactical Ground Station (JTAGS), and assisting space analysts in the Remote Earth Sensing Information Center (RESIC).

"We are pleased to provide critical support to the mission of DDMS, particularly during the early stages of each mission when the ops tempo is at its peak and available active-duty manning is stretched to its limit," says Lt.Cmdr. John Watson of the 0266 DDMS detachment.

Air Force Col. Thomas Friers, the DDMS commander, views the Reservists as an invaluable asset. "Simply put, we could not do this mission without the Navy and Air Force Reservists assigned to DDMS - especially if a Shuttle contingency were to develop. I'd quickly run out of people to do all the things that must be done. Day in and day out the Navy officers also provide us valuable insight and expertise, which is absolutely essential to this mission," says Friers.

What does DDMS do? Explains Friers, "We coordinate and control all DOD and Coast Guard forces supporting a Shuttle contingency." DDMS is operationally aligned under the Commander in Chief, U.S. Space Command, and prior to each mission, tasks DOD units worldwide to provide the support required to respond to a Space Shuttle contingency.

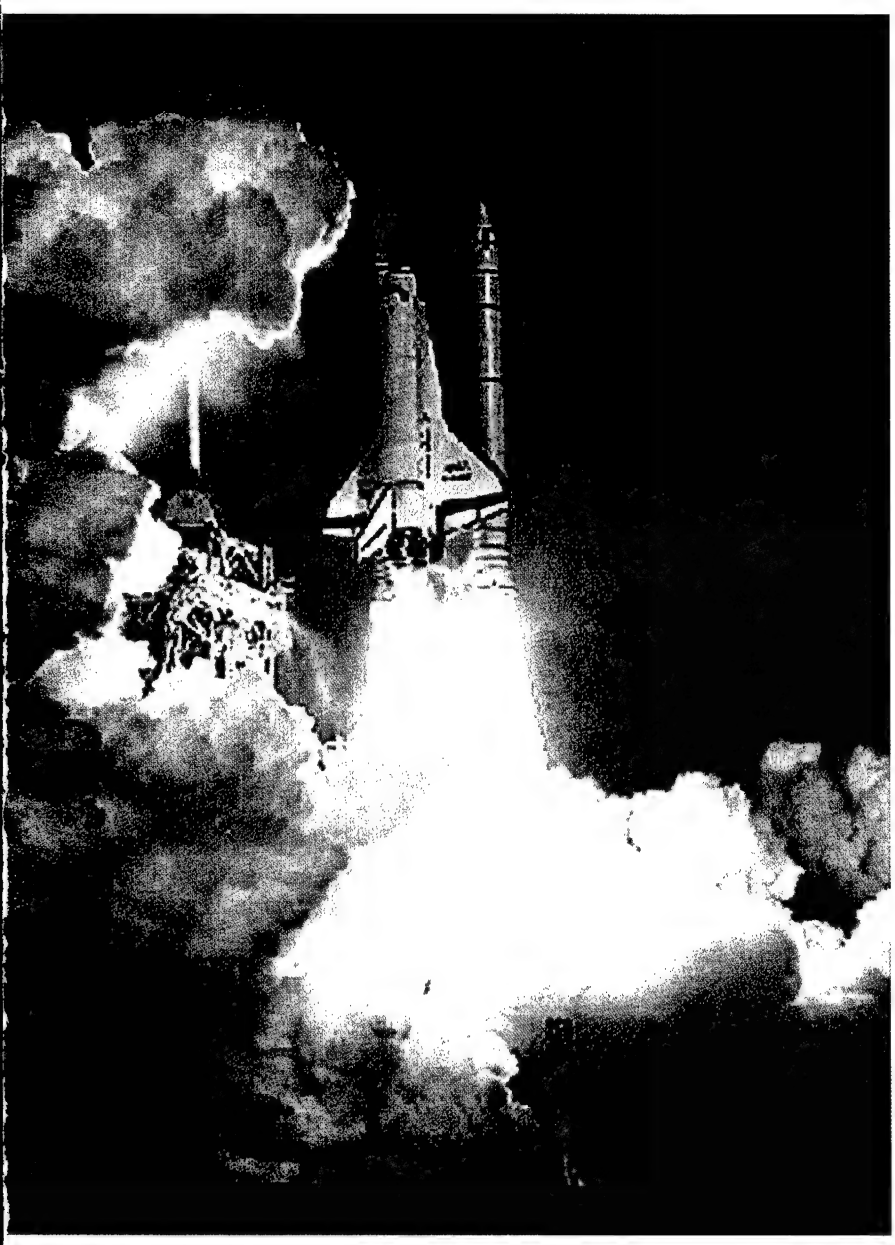
"Our short chain of command allows us to make things happen very quickly," said Air Force Lt.Col. Chris Malbon, special assistant to the DDMS commander, and the most experienced DDMS veteran, having served at DDMS for 12 years.

For the launch phase of each mission, local Air Force helicopters and Air Force, Navy, Marine and Coast Guard fixed-wing aircraft with pararescue and medical personnel are on standby at Patrick Air Force Base and Kennedy Space Center's Shuttle Landing Facility (SLF) in Florida.

Additionally, a Navy ship is postured off shore to support various contingencies during the mission launch phase.

During launches, DOD medical teams are on stand-by at Kennedy Space Center, at DOD East Coast abort landing sites, and emergency landing sites worldwide.

DDMS also plays a vital role in coordinating DOD support for NASA's transoceanic abort landing



Jim Green, director of communications for DDMS (bottom photo left) and Cmdr. Charles Gay of Naval Reserve NAVSPACECOM 0266 operate consoles in the SOC as part of the 10-person launch team for STS-101. In the top photo, Space Shuttle Endeavour surges skyward in a January 1993 mission. NASA Photos

(TAL) sites in Spain and Africa. These sites are at Moron and Zaragoza Air Bases in Spain, Ben Guerir Air Base, Morocco, and Yundum International Airport near Banjul, Gambia. Three of these four sites are normally activated for each shuttle launch.

"During launch phase, there is a window prior to main engine cut-off where problems could arise, forcing astronauts to consider several abort options, including landing at a TAL site," Malbon explains.

In order to accommodate a shuttle contingency landing following launch, these TAL sites stage numerous DOD personnel and assets. DDMS supports these sites with C-12/C-21 aircraft for on-scene weather reconnaissance and in-flight checks of Space Shuttle unique landing aids, C-130 aircraft with pararescue and medical support personnel, and DOD fire, crash, rescue, and weather support. Representatives from DDMS man each activated TAL site for launch.

"The Reserve contingent at DDMS provides the manpower which allows the active duty to deploy to TAL sites during the launch phase of the mission," says Cmdr. Charles Gay, officer in charge of the 0266 Detachment.

For the normal end-of-mission landing day, DDMS coordinates site-specific DOD fire, crash, rescue forces, security, and medevac helicopters at Edwards Air Force Base, Calif., Holloman Air Force Base, N.M., and Kennedy Space Center, Fla.

"Although not quite as asset intensive as launch, the landing phase is still a critical phase of the mission and draws significant DOD support," claims Malbon.

DDMS also operates the DOD Support Operations Center (SOC) at Patrick AFB, starting the day prior to a Space Shuttle launch and continuing through landing. The SOC maintains 24-hour contact with designated DOD emergency landing sites around the world.

Malbon emphasizes that the SOC "serves as the focal point for managing the DOD contingency response for a Space Shuttle emergency." The SOC is where Reservists from the 0266 Detachment and U.S. Space Command spend the majority of their time. "Our reserve folks pay big dividends for DDMS as qualified SOC controllers," states Malbon.

DDMS conducts numerous Space Shuttle contingency exercises throughout the year. These exercises vary from tabletop exercises to major simulations involving nearly 1,000 people.

DDMS plans to conduct one major exercise annually. This major event typically simulates a "crash landing" (Mode VII) or bailout (Mode VIII) scenario, takes months to plan and lasts approximately five days. A typical Mode VII exercise has earned the label as the "largest DOD/NASA rescue exercise" in existence.

"These exercises not only maintain a high level of contingency response currency for NASA and active-duty DOD, but also provide excellent training for reservists who attend," states Lt.Cmdr. Watson.

So the next time a shuttle blasts off into orbit, don't forget the enormous effort and behind the scenes support that DOD active-duty and 0266 Reservists provide through DDMS in its partnership with NASA.

Author Cmdr. Charles Gay is the officer in charge of the Naval Reserve NAVSPACECOM 0266 DDMS Detachment.

NEWS BRIEFS

Naval Space Command Wins Bid to Keep Civilian Jobs

Civilian jobs at Naval Space Command that had been offered up for competition with private industry will remain within the federal government's civil service workforce. However, there will be a reduction in the number of those positions.

Rear Admiral Thomas E. Zelibor, former commander for Naval Space Comand, made that announcement on May 10 in a special meeting for all military personnel and civilian employees in the organization.

Last March, 63 civilian jobs at Naval Space Command were identified for study for competitive outsourcing as part of the Office of Management and Budget's Commercial Activities (CA) program. The initiative has been in place since 1976 as a mechanism to identify government functions that could be performed or obtained from the private sector.

The Navy's goal in 1999 was to study about 26,000 civilian positions nationwide. The functions at Naval Space Command that were studied included civilian watchstander positions in the command's operations center and computer center at Dahlgren — nearly half of the organization's 141 civilians currently on payroll.

Commercial Activity studies are conducted according to OMB guidelines, which outline a structured cost comparison process to determine the most efficient and cost-effetive way to perform a function.

During this process, study teams develop performance work statements that describe the work to be performed, including results or outputs of the current in-house operation. The performance work statements become the basis for a solicitation.

Private-sector bids are screened, and a contractor proposal is selected based on best value and then compared against the government's bid to retain the jobs.

If the contractor bid is at least 10 percent less than the government bid, a tentative decision to outsource is made. No decision is final until all interested parties have had a chance to review and appeal the cost comparison.

In its bid to retain the functions under study "in house," Naval Space Command proposed to implement a streamlined organization plan that will eliminate 18 positions from those that were studied.

"Assuming no change to the contract award, we will aggressively pursue every means available to minimize the impact to our employees," emphasized Rear Admiral Zelibor. "This will include reassignments within the command and voluntary separation incentives where appropriate, as well as transition and priority placement assistance."

The tentative effective date for Naval Space Command to have its new organization plan in place is Oct. 1.

Naval Academy Maintains Satellite for Air Force

By Seaman Stephen L. Woolverton
Trident Staff Writer

High above the earth orbits the REX II, a radiation experiment satellite that is now controlled by the Naval Academy's aerospace engineering department.

The REX II was turned over to the academy by the Air Force Space Test Program in a ceremony at Rickover Hall May 10. Air Force Col. James A. Neumeister, the director of the Space Test Program, handed over control of the satellite to Academic Dean and Provost Dr. William C. Miller.

"It will provide an opportunity for the midshipmen to operate a satellite in orbit," says Associate Professor Daryl Boden, aerospace engineering department. "They will get telemetry data from it, and it will allow the students to analyze the data."

USNA photo by Shannon Bosserman

Air Force Col. James A. Neumeister briefs Academic Dean and Provost Dr. William C. Miller on how the REX II satellite computer system works.

The first class that will use the REX II will be the fall astrodynamics I class.

"We will train the midshipmen in operation procedure. This will give them direct satellite experience," says Air Force Lt. Col. Billy R. Smith Jr., associate professor of engineering at the academy.

The academy received the satellite control equipment in April and has demonstrated its capability of operating the satellite. Because the satellite has completed its mission for the Air Force, the Naval Academy will maintain and use the REX II for training.

In Memoriam
Dr. Herbert Friedman

Dr. Herbert Friedman, 84, Chief Scientist Emeritus of NRL's E. O. Hulburt Center for Space Research at the Naval Research Laboratory (NRL), died on Sept. 9 following a battle with cancer.

Dr. Friedman began his distinguished career at NRL in 1940 as a research physicist in the Metallurgy Division. His early work involved x-ray spectroscopy and the development and application of radiation detectors.

He designed and adapted x-ray spectrometers for use in the manufacture of quartz crystals. This work resulted in a tremendous savings in the fabrication of quartz crystal oscillators, which were indispensable to Fleet operations during World War II. Dr. Friedman also collaborated in the development of an atmospheric radioactivity surveillance system used to detect debris from the first Russian atomic bomb test.

Dr. Herbert Friedman

Dr. Friedman was widely recognized as the father of rocket astronomy, having conducted his first rocket experiment using a captured German V-2 rocket in 1949. Data obtained from his experiments proved the direct relationships between solar x-ray variability and the strength of the Earth's ionosphere.

During the International Geophysical Year (IGY) in the late 1950s, Dr. Friedman led two major experiments involving rocket launchings from naval vessels. The first showed that solar flares emit hard x-rays that produce shortwave radio blackout; the second used a total solar eclipse to isolate x-ray sources in coronal condensations. Experiments conducted by Dr. Friedman produced the first x-ray photographs of the sun. And, in another first, measurements of the ultraviolet fluxes of early-type stars, obtained by Dr. Friedman using small mirror telescopes, produced the first catalog of bright ultraviolet stars.

Dr. Friedman was a principal investigator for the NRL experiment on NASA's High Energy Astronomy Observatory mission of the 1970s that produced an all-sky catalog of about a thousand sources and showed their classification into a variety of objects. He retired from NRL in 1980 as Superintendent of the Space Science Division. — *Naval Research Laboratory*

Naval SATCOM Course Travels to the Fleet

By Emmett Henderson

Naval Space Command took its popular "Naval Satellite Communications" course on the road this summer, presenting the class at the Afloat Training Group in Norfolk, Va.

Nearly 60 students from Fleet, shore and Marine Corps commands located in the Hampton Roads area attended the intensive, two-day course hosted by Commander Second Fleet in August. The occasion was the first time in several years the course was offered outside Dahlgren.

Presented by subject matter experts assigned to Naval Space Command's SATCOM Plans and Policy Branch, the course contained introductory and intermediate information about satellite communications currently available to naval forces. Students learned satellite basics, including how various environmental phenomena such as space weather and overt threats, affect space-based communications.

After the basics, students received briefings on specific satellite communications systems within each band of the radio frequency spectrum. These briefings covered the capabilities and limitations of each system and included systems owned by the government and those leased from commercial providers. The course covered the full spectrum of satellite communications systems, from UHF to EHF.

Open discussion was encouraged throughout the course and a special period was provided prior to closing to allow students to follow-up on previously presented information with additional questions.

The Satellite Communications course began as a Naval Space Command-sponsored one quarter of advanced instruction at the Naval Postgraduate School in Monterrey, Calif. In 1998, in an effort to increase the knowledge of Fleet communicators and communications planners, the course was revised and offered at Naval Space Command headquarters in Dahlgren.

Since 1998 the course has undergone several revisions and is currently held annually in May in Dahlgren. Rear Admiral J. J. Quinn, commander for Naval Space Command, has approved a recommendation to expand the course to include areas of Fleet concentration because of the number of requests received from former students and representatives of the Fleet commanders-in-chief.

Current plans are to offer the course in San Diego, Calif. in early 2001, in Dahlgren, Va. in May 2001, and again in Norfolk in late summer 2001.

Author Emmett Henderson is a SATCOM systems engineer working for Titan/ACS in support of Naval Space Command's SATCOM Plans and Policy Branch.

NEWS **BRIEFS**

'You've Got Mail'

By the Office of Naval Research

The vast possibilities of the Internet are now accessible to those who work beneath the sea.

For the first time ever, a submerged U.S. submarine successfully sent several e-mail messages via the Internet to the shore without surfacing or raising its antenna — two actions that give away its position.

The historic series of tests were conducted aboard USS *Dolphin* (AGSS 555), cruising at a depth of 400 feet, using commercial-off-the-shelf modem technology developed by Benthos Inc. of Falmouth, Mass.

A U.S. Navy submarine has successfully used sound energy to transmit messages over the Internet — while submerged.

The modem sends digital data underwater using sound energy. *Dolphin* was able to send e-mails up to three miles away from a relay buoy, which transferred them to land. The *Dolphin* also communicated with other submerged modems, demonstrating its ability to communicate with underwater devices.

The historic tests were conducted as part of the Seaweb and Sublink 2000 initiatives. The technology has potential civilian applications in the gas and oil drilling industry, weather tracking, and underwater research.

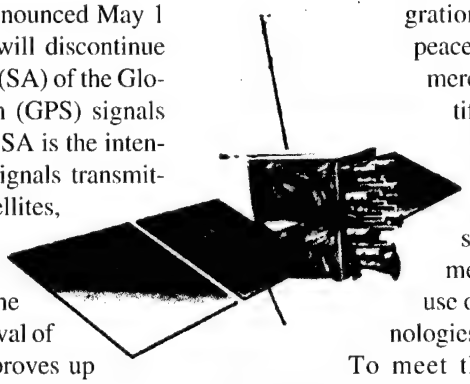
The technology, supported by the Office of Naval Research and other Navy program offices, was developed at the Navy's Space and Naval Warfare Systems Command Center in San Diego.

For more information about ONR programs, refer to the ONR home page at http://www.onr.navy.mil. — *Navy Wire Service*

U.S. Discontinues Selective Availability of Satellite Navigation to Public

By Maj. LeWonnie Belcher

The White House announced May 1 the United States will discontinue "selective availability" (SA) of the Global Positioning System (GPS) signals available to the public. SA is the intentional degradation of signals transmitted by Navstar GPS satellites, providing civilian users with accuracy less than what's used by the military. With the removal of SA, GPS accuracy improves up to tenfold, according to Air Force Space Command officials. The new policy went into effect immediately.



GPS is a dual-use, satellite-based system that provides accurate location and timing data to users worldwide. The 24-satellite GPS constellation is operated and controlled by Air Force Space Command's 50th Space Wing at Schriever Air Force Base, Colo. GPS provides 24-hour navigation services to military and civilians users worldwide.

In his announcement, President Bill Clinton said that in his goals for GPS he wanted to "encourage acceptance and integration of GPS into peaceful civil, commercial and scientific applications worldwide; and to encourage private sector investment in and the use of ... GPS technologies and services. To meet these goals, I committed the U.S. to discontinuing the use of (selective availability)..."

Clinton said the decision to discontinue SA was based "upon a recommendation by the Secretary of Defense in coordination with the departments of State, Transportation and Commerce, the director of Central Intelligence, and other Executive Branch departments and agencies. They realized that worldwide transportation safety, scientific, and commercial interests could best be served by discontinuation of SA."

The President said the decision to discontinue SA is "coupled with ... continuing efforts to upgrade the military utility of our systems that use GPS, and is supported by threat assessments which conclude that setting SA to zero at this time would have minimal impact on national security."

In the White House announcement the President indicated that future threats could be dealt with by applying SA on a regional basis as needed.

"We have demonstrated the capability to selectively deny GPS signals on a regional basis when our security is threatened," Clinton said.

Originally developed by the Department of Defense as a military system, GPS is now used around the world in many applications, including air, road, marine, and rail navigation, telecommunications and emergency response.

To learn more about the Navstar Global Positioning System, go to http://www.af.mil/news/factsheets/, scroll down to SPACE, then NAVSTAR Global Positioning System. — *Navy Wire Service*

NEWS **BRIEFS**

Great Job Opportunity in Satellite Communications for Navy Officer

Naval Space Command is seeking an outstanding officer to fill an important action officer billet opening in 2001.

Naval Space Command is a component of U.S. Space Command and a primary advocate for naval space requirements and capabilities. The Satellite Communications (SATCOM) Plans Branch of the Space Plans Division has established a reputation for proactively projecting, assessing and advocating future naval SATCOM requirements in the joint arena.

We need an energetic, forward-thinking team player to explore and develop Navy's emerging SATCOM requirements and to advocate architectures to satisfy those requirements.

As the SATCOM architecture and requirements action officer, you will be responsible for collecting, assessing and actively advocating the Navy's evolving requirements for satellite communications bandwidth. You will represent naval interests in the earliest stages of the planning, development and acquisition of satellite communications systems.

You will coordinate with FLTCINC representatives, program management offices and systems commands to obtain projections of bandwidth requirements for weapons and C4I systems that are in the planning or acquisition stage.

You will employ modeling and simulation to rigorously compare SATCOM requirements against projected scenarios, force levels and system architectures.

You will research and develop positions for Naval Space Command on a variety of issues related to naval telecommunications, including the space, ground and control elements of SATCOM systems. You may be tasked to brief the results of your requirement analyses to Navy leaders at OPNAV,

*(Please see **Job** on page 18)*

Dr. Shannon Coffey Recognized

Work to Improve Space Object Tracking Garners Astrodynamics Award

Dr. Shannon L. Coffey of the Naval Research Laboratory (NRL) has received the American Astronautical Society's Dirk Brouwer Award in the field of astrodynamics.

The award, presented at the 2000 Space Flight Mechanics Conference in January, recognized Dr. Coffey's contribution in solving critical astrodynamics problems through the use of parallel processing.

Dr. Coffey, who works within the Naval Center for Space Technology at NRL, was cited for his application of parallel processing to maintaining the space object catalog using special perturbations and the determination of near-miss conjunctions of space objects.

Dr. Coffey has demonstrated that the space object catalog — a dynamic database maintained by U.S. Space Command that currently contains nearly 10,000 objects — can be improved using special perturbations (SP).

The SP software incorporates forces generated by the gravity field, the Jacchia atmospheric density model, lunar and solar perturbations, and solar radiation. This results in a much more accurate determination of orbits, making it possible to maintain the catalog with more accuracy and efficiency.

In order to adequately protect the International Space Station from potential collisions with space debris, NASA has established a requirement for tracking objects as small as 1-5 centimeters. A catalog with objects this small would probably contain at least 100,000 objects.

Maintaining a catalog of this size is not feasible with the current serial computation approach. However, the task can be accomplished with parallel processing, which is based on the premise that "to process more objects, just add more processors."

Naval Space Command, the naval service component of U.S. Space Command, maintains the space object catalog as CINCSPACE's alternate space control center. NAVSPACECOM is now in the process of implementing this new approach, which is considered to be one of the most significant breakthroughs in astrodynamics in the past 15 years.

Dr. Coffey's award also referenced his efforts to develop a parallel version of COMBO, a program for predicting close conjunctions of space objects for launches and for all manned space flights. This program is now used operationally by Naval Space Command.

Finally, Dr. Coffey's award recognized his work to advance the knowledge of tether satellite dynamics using the TiPS satellite developed by NRL and launched in 1996.

TiPS's primary objective is to obtain a better understanding of the dynamics of tethered satellites, accomplished primarily by laser tracking. Retro-reflectors are mounted on both sub-satellites. Since the sub-satellites are not in Keplerian orbits, to determine the attitude motion required determining the orbit and attitude motion simultaneously.

Under Dr. Coffey's direction, new algorithms for the simultaneous orbit and attitude determination of TiPS were developed and implemented into an operational program called GEODYN in less than one year. As a result, researchers now have a better understanding of the dynamics of tethered satellites. — *Naval Research Laboratory*

Job

(Continued from page 17)

Fleet, and SYSCOM directorates. You will also develop and instruct elements of the Naval Satellite Communications Course, which is presented several times a year by Naval Space Command for Fleet and FMF personnel.

You will work with Naval Space Command's outstanding team of subject matter experts who have vast expertise in SATCOM system operations, engineering, and technical analysis. This dedicated team is involved in the full spectrum of on-orbit and emerging SATCOM systems, military and commercial, that are available or potentially useful to naval forces. The current systems include UHF Follow-On, Defense Satellite Communications System, Milstar, Polar EHF, INMARSAT, and INTELSAT.

You will develop concepts of operations for Navy's use of emerging SATCOM systems, such as the Wideband Gapfiller, Mobile User Objective System, Advanced EHF and commercial systems.

This is one of the most exciting and challenging billets in the Naval Space Command inventory, offering the opportunity to influence the capabilities of future satellite systems that tomorrow's naval warfighters will depend on.

Naval Space Command is located on board the Naval Surface Warfare Center in Dahlgren, Va., 55 miles southeast of Washington, D.C.

The billet requires a master's degree in space system operations and experience in Fleet telecommunications.

For more information, contact Lt.Cmdr. Ray Lewis, Naval Space Command, Military Support and Administration Branch, DSN 249-5152, (540) 653-5152, email lewis@nsc.navy.mil.

Navy Establishes Missile Defense Office

In July, outgoing Chief of Naval Operations Admiral Jay Johnson announced the formation of a new office on his immediate staff, the Assistant Chief of Naval Operations (ACNO) for Missile Defense.

The ACNO for Missile Defense will have oversight of all policy, planning, budgeting, funding, requirements definition, test and evaluation, deployment, training, operational doctrine, tactics and employment of Naval missile defense systems, including area and theater-wide theater ballistic missile defense (TBMD) as well as overland cruise missile defense. The ACNO for Missile Defense will coordinate all missile defense-related programs and initiatives throughout the Navy.

"As we begin testing in earnest and prepare to deploy theater ballistic missile defense at sea," Adm. Johnson said, "we must pull together all the different pieces and organizations into a more focused team. This will significantly improve the Navy's ability to deliver effective missile defenses."

Adm. Johnson designated Rear Adm. Rodney P. Rempt as the first ACNO for Missile Defense. At the time, Rear Adm. Rempt was serving as Deputy Assistant Secretary of the Navy for Theater Combat Systems.

"Admiral Rod Rempt is our expert on missile defense and this will put him in the driver's seat for Navy TBMD," Adm. Johnson said.

The objectives behind the establishment of the new ACNO for Missile Defense include:

- Clarifying the lines of authority to the CNO and Assistant Secretary of the Navy for Research, Development, and Acquisition with regard to naval TBMD.
- Expanding naval focus on doctrine, joint coordination, interoperability and international cooperative initiatives.
- Providing a single point of contact within the CNO staff for all Missile Defense matters.
- Strengthening coordination with the Defense Department, Ballistic Missile Defense Office, and the other armed services.

In addition to creating this new office, the Navy announced that USS *Lake Erie* (CG 70) has been designated the Navy's theater-wide test ship for the Aegis Lightweight Exoatmospheric Projectile intercept flight-test series.

"The Navy theater wide test efforts are too important to the nation to risk frequently shifting test ships," Adm. Johnson said. "We need a ship and crew to focus full time on this effort."

For the next two years, USS *Lake Erie* will be dedicated to conducting these critical tests.

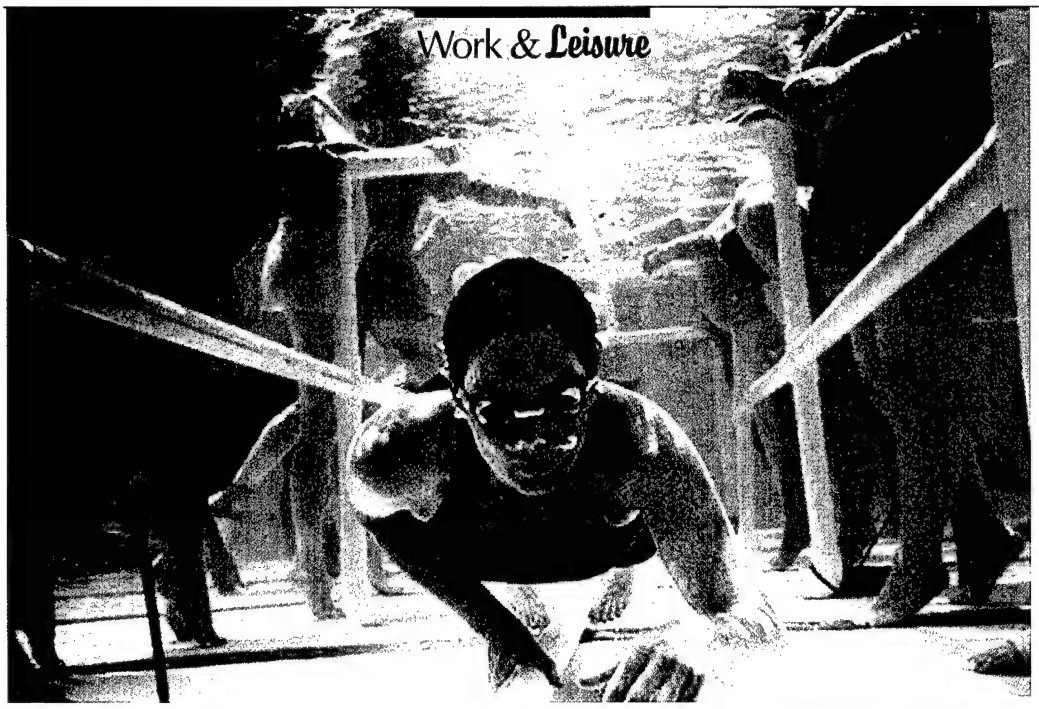
USS *Lake Erie's* homeport in Pearl Harbor, Hawaii, makes the ship's participation in tests at the Pacific Missile Range Facility off Kauai cost-effective. The Navy anticipates the ship will not deploy operationally again for about two years.

Adm. Johnson made it clear that the Navy's first priority remains to develop and deploy effective area and theater-wide defenses at sea.

As the Navy begins testing in earnest and preparing to deploy TMBD at sea, it is necessary to dramatically improve the Navy's posture to deliver effective missile defenses.

The changes announced this summer were intended to strengthen the Navy's TBMD organization and reduce the complexities of coordinating operations, testing and deployment.

Adm. Johnson added, "Navy missile defense is critical to the future of our Navy and the security of our nation. We must succeed in rapidly deploying our evolutionary systems in order to maximize the payoff to the nation inherent in this revolutionary new capability. The steps I have taken give us the team and the focus to ensure we do just that." — *By OASD (Public Affairs)*



Peg Johnson from Spring Ridge Middle School in Hollywood, Md., negotiaties one of the neutral buoyancy tests (left) conducted at the Dahlgren Pool as part of the space education course. Teachers from King George County schools (bottom photo) assemble their model rockets during one of the hands-on classroom sessions.

Teachers 'Discover' Space in Week-Long Graduate Course

By Gary R. Wagner

Thirty educators from six school districts converged on Dahlgren, Va., this summer to learn how to teach space-related studies in their classrooms.

Naval Space Command hosted the week-long "Space Discovery" course sponsored by the Space Foundation in Colorado Springs, Colo. The collaboration was the first time a Navy activity has partnered with the foundation to provide the training.

Held in August, the course encompassed a wide range of topics focused around living and working in space, as well as principles of flight and rocketry. Lectures by Space Foundation instructor James Dean also covered Earth and space research and spin-off technologies, the future of flight, and a look at the latest discoveries about the planet Mars.

Collaborative learning exercises conducted by Kyndra Hill and Carol O'Leary from the Space Foundation included using paper airplanes to study roll, pitch and yaw of aircraft, studying the behavior of toys in space to understand principles of microgravity, and the construction of model rockets.

Guest lecturers from Naval Space Command provided a portion of the week's curriculum. An introduction to space basics was offered by Chief Petty Officer Henry Pickard. Marine Captain Shawn Mansfield reviewed space systems used by U.S. military forces in support of day-to-day operations. A look at the space environment and types of "space weather" was offered by Lt.Cmdr. Brian Baldauf. The teachers were also given a tour of NAVSPACECOM's Operations Center by Navy Lt. Marie Gordon.

The "Space Discovery" course also included a neutral buoyancy training experiment at the Dahlgren Pool. The exercise was structured to give the teachers an opportunity to replicate the weightlessness astronauts experience in space as they made their way through an underwater cage of PVC tubing.

After learning about the Global Positioning System (GPS), the teachers were issued hand-held GPS receivers and sent on a "scavenger hunt" to locate precise navigational points or landmarks at Dahlgren.

The class culminated with "launch day" as the teachers had an opportunity to test flight the rockets they had built. An awards luncheon that concluded the course featured Navy astronaut Cmdr. Christopher Ferguson as guest speaker. He thanked the teachers for their dedication to providing quality education for America's youth.

Naval Space Command and the Space Foundation have initiated planning for another space course at Dahlgren for the summer of 2001.

MTCM Alan Steiner Reports as Command Master Chief

Master Chief Missile Technician (Submarines) Alan P. Steiner reported to Dahlgren, Va., in December 1999 to serve as Naval Space Command's new command master chief.

Originally from San Antonio, Texas, he joined the Navy in 1976. During basic training, he volunteered for submarine duty and subsequently completed Polaris Electronics "A" School and Missile Technician Poseidon "C" School.

In January 1978, he reported to USS *James Madison* (SSBN 627) (GOLD) where he earned his Silver Dolphins during a three-and-a-half year sea tour. After another three years at sea on board fleet ballistic missile submarine resupply ships (T-AKs) deployed from Polaris Missile Facility Atlantic, he transferred to the Fleet Ballistic Missile Submarine Training Center in Charleston, S.C.

While serving as a C4 Team Trainer instructor, he was credited with developing the team trainer curriculum and improving the trainers' credibility in grading criteria and crew support.

In August 1987, he reported to USS *Woodrow Wilson* (SSBN 624) (GOLD) as Missile Division leading petty officer and command career counselor. During his tour, he was advanced to chief petty officer. After combining the *Woodrow Wilson* crews for SSN operations, he transferred to USS *Casimir Pulaski* (SSBN 633) (GOLD) and stayed with the boat through its decommissioning at Puget Sound Naval Shipyard.

MTCM(SS) Steiner

Upon reporting to shore duty at the Strategic Weapons Facility Atlantic (SWFLANT), he was advanced to senior chief petty officer and assigned as assistant command master chief, senior watch officer, leading chief and head of the Explosive Branch for the SWFLANT explosive handling wharves facility.

While at SWFLANT, he was an integral part of the Strategic Arms Reduction Treaty (START) escort and operations team involved in system baseline and follow-on inspections, as well as the first re-entry vehicle on-site inspection. He also completed screening and was recommended for Chief of the Boat (COB).

He transferred to USS *Rhode Island* (SSBN 740) (BLUE) as COB after graduating from the Senior Enlisted Academy in Newport, R.I., in March 1997, and was advanced to master chief petty officer one month later.

While he was assigned to *Rhode Island*, the ship was awarded CINCLANTFLT's Golden Anchor and Commander Submarine Squadron 20's Battle Efficiency "E" awards for 1998.

Command Master Chief's Corner

Greetings from sunny Dahlgren, Virginia! It is my hope to provide the readers of *Space Tracks* with regular columns from this desk with updates on the pulse of Naval Space Command as seen from my perspective as your Command Master Chief.

First and foremost, I wanted to express my sincere appreciation for the welcome and camaraderie I received during my first few months here. My tours around the world visiting each of you have provided me with an understanding of how you live and work and the concerns we face as a unique command in today's Navy.

I have been very impressed with the high quality Sailors we employ and deploy around the world in support of our mission. At each site I found dedicated and extremely hard charging professionals striving to provide the absolute best of a myriad of products and services to warfighters on a global scale.

At each site I provided you with briefs on the latest information concerning Navy and NAVSPACECOM policy changes and the grapevine information I get from my shipmates at various high-level commands. Many of the items we discussed have already come to pass with the elimination of PARS and the requirements to complete rate training courses and the new Guard III program. Still in the works are the new Sea Duty Pay scale, Eval/Fitrep Working Groups, Thrift Savings Plan initiatives, NAVSPACECOM Continuous Improvement Program, revised Sailor of the Year Program and new recruiting efforts.

I expressed my priorities and goals during my tour. Primary of these is improved quality of life for each of you, increased retention and minimizing our attrition numbers. After each visit, I provide feedback to the admiral and his staff on the issues and concerns each of you express. We are continuing to work on those issues we have not yet put to rest such as Rate Training Manuals for ETs, availability of college courses, JTAGS watch shifts and improving communications from HQ to all of you.

Additionally I hope I instilled in you the understanding that I, as your Command Master Chief, am here to serve you in the furthering of your military career and personal goals.

I will continue to visit as much as I can and do my best to keep you up to date on new initiatives and the benefits the finest Navy in the world can provide you and your families. In the meantime, you all know how to reach me.

I look forward to seeing each of you again and charging forward with this outstanding team of unique professionals at Naval Space Command. Keep up the great work and stay in touch.

FSSC 'Scrapes and Paints' in Community Outreach

By JO2 Kaye Trammell

Jim Clark and Wende Shannon (above) paint porch columns at a home in Moyock, Va. The group of painting volunteers from FSSC is pictured below. Photo by JO2 Trammell

When the people at Fleet Surveillance Support Command (FSSC) in Chesapeake, Va., want to do a good deed, they won't take "no" for an answer. The Community Relations Office (COMREL) is no exception. When the command set its sights on volunteering in a local paint project and hit a brick wall, command officials simply went down a different avenue. After all, the point of community relations isn't just to look good — but to do good.

"We were originally supposed to work with Paint Your Heart Out in April, but they told us that they didn't have enough houses for volunteers to be painted," said IT2(SW) Kevin Hester, FSSC COMREL Officer.

After command COMREL officials discussed their volunteering dilemma with co-worker and North Carolina native Jim Clark, he thought he just might have a solution where everyone could benefit. Using his community connections, Clark contacted Moyock Baptist Church Pastor of 17 years, Vic Ramsey. Ramsey immediately found a pair of sisters who fit the bill and needed a paint touch-up around their home. Working with local merchants, Ramsey and FSSC COMREL procured paint donations for the project. Ramsey's congregation, so touched by the kindness of the Navy command, provided a buffet style lunch for the volunteers to keep them energized through the day.

"(The West sisters) have lived in this house all of their lives," said Ramsey of the elderly homeowners. "These are folks who have given of themselves in this community and don't have the means to get this work done, and it's needed doing."

Josephine West, who welcomed a team of 15 FSSC volunteers onto her property to scrape and paint her two large southern porches, said the home has been in her family for nearly 100 years since her grandparents moved in at the turn of the 20th century. West, 70 years old, and her disabled sister were each brought home to the Moyock home after being born in a Norfolk hospital.

West couldn't believe her good fortune as the FSSC personnel invaded her property and immediately began the work of the day.

"I think it's wonderful," said West. "It's an answered prayer."

The elation of the West sisters was evident to the volunteers who were eagerly chipping and painting throughout the day. "She feels like she's won the lottery," said Hester.

West wasn't the only one with a big smile on her face all day.

"This makes you feel good because you're doing something productive for someone who really needs help," said ISC(SW) Jim Rider.

According to most of the volunteers, doing good deeds on local turf was the main draw when it came to signing up for the project.

"We do this overseas all the time but we don't do it enough in our own backyard," said ETCS(SW/AW) Michael Sheeley, Command Senior Chief.

"I'm here to help out someone in my own neighborhood," said Wende Shannon. "I can see the immediate benefits of what we do here. Every time I go down this road I'll see it. I (volunteer) regardless of where it was, but its nice to have it here in my own community. The Navy does a lot of good overseas, in their hometown and in your own hometown."

That hometown message is certainly one FSSC wants to send to its neighbors in Moyock.

"The Navy, by its community relations, can show its good citizenship," said Clark. "In two years most (Sailors) come in and roll out, but the things one does in the community stay after that two-year billet."

Although the day's work was hard and volunteers spent more time "scraping their hearts out" rather than "painting their hearts out," all agreed on the importance of their presence.

"That is what a community is about," said Ramsey. "It's about taking care of each other's needs."


CTA1(SW) Lewis


DS2(SW) Rawlings


Deborah Perini


Robert Graham


Eugene Mullen


Sharon Colley

NAVSPACECOM Salutes People of the Quarter

Civilian and military personnel at Naval Space Command were selected for quarterly awards for January through March 2000.

Petty Officer 1st Class James E. Lewis was Sailor of the Quarter. His award recognizes his performance as the command's assistant Special Security Officer. Specifically, he is commended for his efforts during off-duty hours in working with drilling Naval Reserve units at the command to streamline the process for submitting investigation packages and, thus, improve the Reserves' readiness posture.

He also played a major role in the retrofit of the command's access control and alarm system, and he spearheaded the establishment of the command's Petty Officer Association, a group that has already been very active in welfare and recreation events.

Lewis, originally from Bellingham, Mass., enlisted in July 1985 and specialized as a cryptologic technician (administrative). His Navy assignments have included the command ship USS *Mount Whitney*, the Naval Communications Area Master Station WESTPAC, the Naval Reserve Center in Baltimore, Md., the Naval Security Group Activity at Adak, Alaska, and the Naval Space Technology Program of the Space and Naval Warfare Systems Command (SPAWAR) in Washington, D.C.

He reported to Naval Space Command in August 1999 following a two-year tour on board the cruiser USS *California* (CGN 36).

Petty Officer 2nd Class Kevin D. Rawlings was Junior Sailor of the Quarter. An electronics technician with the command's ADP Operations and Maintenance Branch, he was commended for his work as network administrator. In that role, he supports and maintains 300 network user accounts on both classified and unclassified local area networks at Naval Space Command. He also supports the command's classified and unclassified intranet LANs.

Among recent tasks, Rawlings has trained command ADP maintenance personnel on computer repair and operating system software. In addition, during the first quarter of the year, he responded to over 200 network or hardware trouble calls and assisted with the setup and configuration of 70 network user accounts for four Naval Reserve units.

Originally from Baltimore, Md., Rawlings enlisted in 1991. He served on board the aircraft carrier USS *Enterprise* (CVN 65) and with the Fleet Training Center in Dam Neck, Va., prior to joining Naval Space Command in February 1998.

Deborah N. Perini was the Senior Civilian of the Quarter. She was commended for her performance as a supervisory mathematician in the Information Systems Division. She was cited, in particular, for her technical leadership in planning for the implementation of software modifications to NAVSPACECOM's Mission Processing System.

Perini was also recognized for her leadership of the team of NAVSPACECOM and Naval Research Laboratory personnel working to develop the special perturbations catalog releases 2.1 and 2.2. In addition, she worked on Naval Space Command's technical augmentation team that worked to ensure a smooth Y2K transition for computer systems.

Robert B. Graham, Jr. was Civilian of the Quarter. As the assistant security manager and Assistance Force Protection Officer, he was commended for his efforts to provide for personnel security, physical security and antiterrorism support.

In particular, Graham provided 20 country-specific antiterrorism briefs to deploying command personnel. In addition, he saved the command $46 thousand by obtaining digital combination locks through the DoD lock program and volunteering for retrofit training.

Eugene H. Mullen was Operations Watchstander of the Quarter. His award was based on his performance in support the Fleet and U.S. Space Command as a space control analyst supervisor (SCAS).

During much of the first quarter of this year, Mullen stood numerous hours of overtime when the Naval Space Operations Center watch was understaffed by two personnel due to unexpected losses. He worked all crew positions during this period, including sensor data analyst, orbital analyst, space event analyst, as well as serving as SCAS.

Sharon D. Colley was ADP Watchstander of the Quarter. She was commended for her decisive action to bring the command's Mission Processing System back on line following an accidental power outage. She quickly restored the system's external connectivity by switching to backup communication processors and restoring data flow from the command's field stations. In addition, she performed a recovery on data queued during the outage.

Colley is a computer operator in the ADP Operations and Maintenance Branch.

Decorated Service and Special Recognition

Legion of Merit
Rear Adm. Thomas E. Zelibor

Meritorious Service Medals
Cmdr. Gerald N. Smith
Lt.Cmdr. Gino Celia
Lt.Cmdr. Bruce A. Dickey
Lt.Cmdr. Mark A. Sanford
Lt.Cmdr. Sonya R. Smith
CWO3 Curtis D. Bell
CTACM Denise M. Collins
CTOC(AW) Kenneth Searles

Navy & Marine Corps Commendation Medals
RMC(SW) Bobby N. Lowery
Lt.Cmdr. Brian K. Baldauf
Lt. Danny K. Busch
Lt. Steven R. Davis
Lt. Oscar Tequida
OSC(SW) Thomas E. Savoy
YN1(SW) Mark A. Clancy
IS2(SW) Darin M. Kroft

Navy & Marine Corps Achievement Medals
EW1(SW) Sean E. Whiteman
ET2 William J. Grace
IS2 John J. Fritz
IS2 Robert Guillory
IS2 John P. King

Good Conduct Medals
YN1 Tena Harshman (5th)
CTO1(SW) Michael Henze (4th)
CTO2 Rachel Eisner (2nd)
OS2 Chandra Waters (2nd)
OS2 Naketa Shirriel (1st)
CTO3 Rebecca Stidam (1st)

Group Achievement Award
Patricia Langley, Karen Martin, Jim Rose and Ken St.Clair, members of Naval Space Command's Commercial Activities Team, received a group achievement award from Commander Naval Space Command. They were responsible for evaluating workload data and developing the Most Efficient Organization to compete against private industry. Their efforts resulted in a revised organizational structure that will save the government approximately $2 million over the lowest contractor bid received.

Shining Stars
Lt.Cmdr. Mark Sanford, Lt.Cmdr. Michael Larios, Jonathan Boers and Herbert Reynolds were recognized for their assistance to the worldwide student tracking teams of Project Starshine in their attempt to observe and photograph the re-entry of the Starshine 1 satellite in February. The re-entry predictions that the Naval Space Command team provided during the final two weeks of Starshine's orbital life helped alert student teams from 700 schools in 18 countries that re-entry might occur in their particular area.

Letters of Commendation
Sharon D. Colley
Robert B. Graham
CTO3 Michael C. Heissenbuttle
Diane B. Jacobs
CTA1(SW) James E. Lewis
OS2 Troy P. Massey
Eugene H. Mullen
Deborah N. Perini
DS2(SW) Kevin D. Rawlings
OS2 Calvin L. Revelle
IS2 Brian Shepos

Letters of Appreciation
Diane B. Jacobs
Lt.Cmdr. Joseph Kinder
YN2 Joseph Parent
Dr. Paul W. Schumacher, Jr.

Civilian Length of Service Awards


Sam Estill


Linwood Crawford


Alan Bauer


Michael Cooper


Wayne Slater

35 Years
Sam Estill

30 Years
Linwood Crawford

25 Years
Alan Bauer
Michael Cooper
Wayne Slater

20 Years
Betty Buck
George Buffkin
Michael Garrett
Karen Martin
Jim Rose

15 Years
B.J. Andersen
Denise Chase
Wanda Flannery
Jinx Messick
Betty Scates
Terri Smith
Virginia Stumpf

10 Years
Eric Brown
Dawn Lowe

CALENDAR

Meetings & Symposia

32nd Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting, Nov. 28-30, Reston, Va. Sponsored by U.S. Naval Observatory and Naval Research Laboratory. Call (202) 767-5111.

Courses & Seminars

O Multi and Hyperspectral Imaging, Nov. 2-3, Washington, D.C. Sponsored by Technology Training Corp. Call (310) 563-1223 or visit web page http://www.ttcus.com.

Following courses sponsored by the AFCEA Professional Development Center. Call (800) 336-4583, ext. 6135 or (703) 631-6135 or visit Web page http://www.afcea.org.

O Military Satellite Communications (Classified), Oct. 30-Nov. 3, Fairfax, Va.

O Global Command & Control System (Classified), Nov. 13-17, Fairfax, Va.

O The U.S. Intelligence Community: Who Does What, With What, For What (Classified), Nov. 28-30, Fairfax, Va.

O Advances in C4ISR Architecture Framework Implementation, Dec. 6-8, Fairfax, Va.

Following courses are sponsored by the Applied Technology Institute. Call (888) 501-2100 or visit Web page http://www.ATIcourses.com/.

O Defense Satellite Communications Systems, Oct. 30-Nov. 1, College Park, Md.

O GPS Technology, Oct. 16-19, Middletown, R.I.

O Satellite Communication Systems Engineering, Nov. 7-9, Los Angeles, Calif.

O Satellite RF Communications and Onboard Processing, Nov. 14-16, College Park, Md.

O Small Satellite Design and Technology, Oct. 23-26, New Carrollton, Md.

O The Space Environment — Implications for Spacecraft Design, Nov. 13-14, Huntsville, Ala. and Nov. 15-16, New Carrollton, Md.

O Spacecraft Systems Design and Engineering, Nov. 28-Dec. 1, Beltsville, Md.

Following courses sponsored by Launchspace, Inc. Call (800) 960-0047 or visit Web page http://www.launchspace.com.

O Payload Integration and Processing, Oct. 16-17, Washington, D.C.

O Advanced Launch Systems, Oct. 16-18, Washington, D.C.

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